# STANDARD
# NURSE PROTOCOLS
# FOR
# TUBERCULOSIS (TB)

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# STANDARD NURSE PROTOCOL FOR UNCOMPLICATED PULMONARY TUBERCULOSIS (TB) AGE 15 AND OVER

(Treatment for children from birth through 14 years requires referral to district contract TB physician)

**DEFINITION**

Tuberculosis (TB) is an infectious disease transmitted through the air in droplet nuclei that are produced when a person with active TB disease of the lung or larynx sneezes, coughs, speaks, or sings. Persons breathing air contaminated with these droplet nuclei may become infected with TB.

Generally, a positive culture or positive Nucleic Acid Amplification test (NAAT) for *Mycobacterium tuberculosis* is necessary to confirm the diagnosis of a tuberculosis case. However, suspected cases may be diagnosed on the basis of: a positive sputum smear for acid-fast bacilli (AFB); lung histology showing necrotizing granulomas with or without AFB; or clinical syndrome, even when a culture or pathologic specimen has not been, or cannot be, obtained.

**ETIOLOGY**

Causative agent of TB is the *Mycobacterium tuberculosis* (*M.tb*) complex (*M. tuberculosis, M. bovis, M. africanum, M. microti, M. canetii, M. caprae, M.mungi and M. pinnipedii)*.

**SUBJECTIVE**

**Patient provides a detailed health history.**

If any of the following conditions are present, the case is considered a complicated TB case and **is not treated under protocol, but must be referred to the district contract physician for treatment:**

1. Children from birth through 14 years
2. Extrapulmonary TB
3. Currently pregnant or breast-feeding
4. Known history of infection or exposure to multiple drug resistant (MDR) *M. tuberculosis*, or any drug resistance on susceptibility testing
5. Known HIV infection
6. Other new and/or complicated acute or chronic medical conditions including (but not limited to): diabetes, renal insufficiency with estimated creatinine clearance less than 50 ml/min., end-stage renal disease on hemodialysis

7. BMI greater than 30 (massive obesity)

8. Known allergies to anti-tuberculosis drugs

9. Treatment with once-weekly isoniazid and rifapentine during the continuation phase

10. Decision to extend the continuation phase longer than four months (e.g. culture collected at 60 days (2 months) after treatment initiation is positive).

Individuals with uncomplicated pulmonary TB, i.e., **patients with none of the aforementioned conditions that are considered complicated TB, can be treated using this protocol:**

1. May have history of exposure to a known case

2. May have one or more of the following:

    a. Productive, prolonged cough (usually more than two or three weeks duration)

    b. Fever

    c. Chest pain or pleuritic pain

    d. Chills

    e. Night sweats

    f. Easy fatigability

    g. Loss of appetite

    h. Weight loss without dieting

    i. Hemoptysis (coughing up blood)

**OBJECTIVE**

**1. Physical evaluation according to programmatic guidelines**

2. The following criteria are useful in identifying a suspected pulmonary TB case:

a. A positive interferon gamma release assay (IGRA) or a positive Mantoux tuberculin skin test.
(The absence of a positive IGRA or reaction to the skin test does not rule out the diagnosis of TB disease or latent TB infection).

b. Positive staining of acid-fast bacillus (AFB) in sputum(s), bronchial brush, wash or lung tissue biopsy. (However, cases can be smear negative).

c. Chest x-ray showing abnormalities compatible with TB disease. (Radiographic findings of healed, inactive TB and reactivating TB sometimes cannot be distinguished).

d. Symptoms compatible with TB (See Subjective: #2, p. 6.**2**) which respond to treatment with anti-tuberculosis drugs.

3. The following criteria (one or more) are required for a confirmed diagnosis of pulmonary TB:

a. Pulmonary pathology findings compatible with the diagnosis of TB.

b. Respiratory specimens with positive culture or positive Nucleic Acid Amplification test (NAAT) for *Mycobacterium tuberculosis.*

**ASSESSMENT**

1. Uncomplicated pulmonary tuberculosis
**OR**
2. Suspected case of uncomplicated pulmonary tuberculosis

**PLAN** **DIAGNOSTIC STUDIES**

1. If positive **results for either an** interferon gamma release assay (IGRA) or a tuberculin skin test cannot be verified (including millimeters [mm] of induration), perform a Mantoux tuberculin skin test or interferon gamma release assay (IGRA). Vaccination with live viruses may interfere with **either of these** test reactions. For persons scheduled to receive a tuberculin skin test, testing should be done as follows: Either on the same day as vaccination with live-virus vaccine or 4-6 weeks after the administration of the live-virus vaccine. At least one month after smallpox vaccination.

2. **Collect three (3) sputum specimens on consecutive days and send them to the Georgia Public Health Laboratory (GPHL) in Decatur. Use the lab slip found on the GPHL website at http://health.state.ga.us/programs/lab/manual.asp.**
**Check**
   - **Smear, Culture, and Sensitivity**
   - **NAAT (Nucleic Acid Amplification Testing)**

   **The public health nurse (PHN) will obtain the first sputum specimen and provide the patient with two additional containers for collection and mailing of the next two specimens. Instructions should be given to both patient and family on how to properly produce sputum for examinations. At least one of the specimens collected must be an early morning specimen as they provide the highest yield for detecting *M.tb*. Ideally the initial specimens should be collected over a three day period, however multiple samples may be collected in the same day provided that 8 hours has elapsed between collections and at least one is an early morning specimen. Seek patient confirmation regarding mailing of specimens and check with the laboratory to confirm receipt of the specimens. If necessary, the PHN should collect and mail the specimens. Optimum sputum specimens contain an 8-10 ml sample; however any amount collected will be tested at the state lab. Specimens received by the lab that contain less than a .5 ml sample may have an insufficient quantity of material for all lab testing to be performed.**

3. Collect blood to obtain baseline measurements for the following lab tests:

   a. Obtain aspartate aminotransferase (AST) [formerly, serum glutamic oxaloacetic transaminase (SGOT)], alanine aminotransferase (ALT) [formerly, serum glutamic-pyruvic transaminase (SGPT)], bilirubin, alkaline phosphatase, CBC with platelet count, serum uric acid, serum creatinine, glucose, and Hepatitis C antibody for all adults. If glucose is above normal range (per reported parameters), obtain a hemoglobin A1C at next visit. On known diabetics, obtain a hemoglobin A1C with baseline lab tests.

   b. Hepatitis B profile should be obtained for all adults (regardless of birth country) and anyone less than 18 years old who is foreign-born.

c. All individuals will be tested for HIV using the opt-out approach. Consent is inferred unless **patient** declines testing. If HIV-infected, collaborate with HIV Program to obtain CD4 T-cell count, then refer to consulting physician. (See REFERRAL section on pp. 6.1**3-14**).

4. Obtain baseline visual acuity testing and red/green color discrimination for **patient**s being placed on ethambutol.

5. Pregnancy test, if indicated.

6. Baseline weight. (Compare **patient**'s baseline weight to usual weight for increase or decrease).

7. Record height. Calculate current BMI and record under initial weight. The following website provides a tool for calculating BMI: http://www.cdc.gov/healthyweight/assessing/bmi/

## THERAPEUTIC

### PHARMACOLOGIC

**NOTE**: Order medications for treatment with directly observed therapy (DOT) from drug stock and send a copy of the drug order(s) to the District Pharmacist or District Drug Coordinator.

1. Order DOT for all doses until completion of treatment (see Tables 1 and 2 on pages 6.**6** and 6.**7** for options and dosages). **DOT is required for all suspected and/or confirmed active cases.**

2. Pyridoxine (Vitamin $B_6$) 25 - 50 mg PO daily, to prevent the development of isoniazid-induced peripheral neuropathy.

## Table 1: Regimen Options - Treatment of Patients with Drug-Susceptible TB

| Option | Total Duration (Months) | Initial Phase | | Continuation Phase | | Comments |
|---|---|---|---|---|---|---|
| | | Drugs | Interval & Dose # (minimal duration) | Drugs | Interval & Dose # (minimal duration) | |
| 1 | 6 | Isoniazid<br>Rifampin<br>Pyrazinamide<br>Ethambutol | Daily DOT for 40 doses (8 wks) | Isoniazid<br>Rifampin | Daily DOT for 90 doses (18 wks)<br>OR<br>Twice-weekly DOT for 36 doses (18 wks)<br>OR<br>Thrice-weekly DOT for 54 doses (18 wks) | Regimen must be directly observed.<br><br>Continue ethambutol until susceptibility to isoniazid and rifampin is demonstrated.<br>. |
| 2***** | 6 | Isoniazid<br>Rifampin<br>Pyrazinamide<br>Ethambutol | Daily DOT for 10 doses (2 wks), then twice-weekly DOT for 12 doses (6 wks) | Isoniazid<br>Rifampin | Twice-weekly DOT for 36 doses (18 wks) | Regimen must be directly observed.<br><br>Include ethambutol in initial phase. After the initial phase, continue ethambutol until susceptibility to isoniazid and rifampin is demonstrated. |

**NOTE:** Daily DOT = 5 days/week (Monday through Friday). Self-administered doses (including those on weekends) will not be counted toward the total doses.

**NOTE: 5 daily doses of DOT equal 2 twice-weekly doses of DOT**

**NOTE:** Pyridoxine (Vitamin $B_6$) 25- 50 mg/daily should be added to all regimens to prevent development of isoniazid-induced peripheral neuropathy.

***NOTE:** Option 2 should NOT be used for patients with HIV infection, cavitary pulmonary TB, disseminated TB, vertebral TB or for patients who have co-morbid medical conditions such as diabetes mellitus, end-stage renal disease or liver disease.

**NOTE:** Split dosing should be avoided.

**NOTE:** Rifamate, a fixed combination of Rifampin 300 mg, and Isoniazid 150 mg, may be used to minimize the number of pills.
Intermittent dosing is not recommended with fixed combination medications.

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interaction.

## Table 2: First-Line TB Drugs

| Drugs | Adult Dose based on body weight in kilograms (kg)* | | | Adverse Reactions |
|---|---|---|---|---|
| | Daily | Twice-Weekly | Thrice-Weekly | |
| Isoniazid | 300 mg (5 mg/kg Maximum Dose 300 mg) | 900 mg (15 mg/kg Maximum Dose 900 mg) | 900 mg (15 mg/kg Maximum Dose 900 mg) | • Gastrointestinal (GI) upset<br>• Liver enzyme elevation<br>• **Acute** Hepatitis<br>• Peripheral neuropathy<br>• Mild effects on central nervous system<br>• Drug interactions |
| Rifampin | 600 mg (10 mg/kg Maximum Dose 600 mg) | 600 mg (10 mg/kg Maximum Dose 600 mg) | 600 mg (10 mg/kg Maximum Dose 600 mg) | • Orange discoloration of body fluids and secretions<br>• Drug interactions<br>• GI upset<br>• Hepatitis<br>• **Easy bruising / b**leeding<br>• Influenza-like symptoms<br>• Rash |
| Pyrazinamide** | 40-55 kg: 1000 mg<br>56-75 kg: 1500 mg<br>76+ kg: 2000 mg | 40-55 kg: 2000 mg<br>56-75 kg: 3000 mg<br>76+ kg: 4000 mg | 40-55 kg: 1500 mg<br>56-75 kg: 2500 mg<br>76+ kg: 3000 mg | • GI upset<br>• Joint aches<br>• Hepatitis<br>• Rash<br>• Hyperuricemia<br>• Gout (rare) |
| Ethambutol** | 40-55 kg: 800 mg<br>56-75 kg: 1200 mg<br>76+ kg: 1600 mg | 40-55 kg: 2000 mg<br>56-75 kg: 2800 mg<br>76+ kg: 4000 mg | 40-55 kg: 1200 mg<br>56-75 kg: 2000 mg<br>76+ kg: 2400 mg | • Optic neuritis |

*Formula used to convert pounds to kilograms: Divide pounds by 2.2 to get kilograms.
*Example: **Patient** weighs 154 pounds ÷ 2.2 = 70 kilograms.*

** Calculate pyrazinamide and ethambutol doses using actual body weight. **NOTE**: Round up fractions of a dose to the nearest whole number. Massively obese **patients** (BMI over 30) are considered complicated cases and dosing should be determined by district contract TB physician.

Directly Observed Therapy (DOT) is mandatory.

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions.

**NOTE:** Ethambutol and pyrazinamide dosage adjustment may be needed if there is renal impairment. Patients with estimated creatinine clearance less than 50 ml/min or those with end-stage renal disease on dialysis are considered complicated cases and dosing should be determined by district contract TB physician.

## PATIENT EDUCATION/COUNSELING

Education/communication should use methods adapted to **patient's** cultural and linguistic background. Provide education to the **patient** and his/her family, when family is available, and document in the patient record.

1. The *"12 Points of Tuberculosis (TB) Patient Education"* and the *"Patient Tuberculosis Education Record"* is located on the TB web pages at http://www.health.state.ga.us/programs/tb/phclinicforms.asp

    - Transmission of Tuberculosis
    - Differences between latent TB infection (LTBI) and active TB disease
    - Progression of LTBI to active TB disease
    - Signs and symptoms of TB disease
    - Importance of HIV testing
    - Respiratory isolation and use of masks
    - Infectious period
    - Importance of chemotherapy as prescribed
    - Side effects and adverse medication reactions
    - Directly Observed Therapy
    - Importance of regular medical assessments
    - Importance of contact investigation

2. The rationale for using an alternative or back-up method of birth control (e.g., copper-bearing IUD such as ParaGard, condoms, diaphragm) is that when rifampin is prescribed, it reduces effectiveness (degree depending on method) of combined oral contraceptives, progestin-only oral contraceptives, levonorgestrel implants, Depo-Provera, patch and ring. Advise condom back- up. (Table 4 on page 6.1**6** – Drug Interactions - Rifampin).

3. The **patient's** immunization status. Assess and administer vaccines indicated according to the current Advisory Committee on Immunization Practices (ACIP) childhood or adult immunization schedule. Although no data exist regarding whether measles, varicella or live varicella vaccine exacerbates TB, vaccination is not recommended for persons who have untreated active TB. See the Georgia Immunization Program Manual, Recommended Schedule and Guidelines, for current ACIP schedules and administration guidelines for each vaccine. The Georgia Immunization Manual may be accessed online at http://www.health.state.ga.us/programs/immunization/publications.asp

4. If smoker or tobacco user, refer to a local cessation program and/or the Georgia Tobacco Quit Line, 1-877-270-STOP (7867).

5. If substance abuse known or suspected, refer for appropriate counseling.

**FOLLOW-UP**

1. Continued **patient** management/follow-up by a case management team comprised of the **patient**, nurse, physician and others determined by an individual needs assessment. Refer to the ***TB Program Policy and Procedure Manual, 2014*** and *Tuberculosis Nursing: A Comprehensive Guide to Patient Care, 2nd Edition* located in each county health department and *"*Scaled Goal Matrix Tool: Uniform Clinical Performance Measures for TB Nurse Case Managers, 2006" located on the TB web pages at http://www.health.state.ga.us/programs/tb/phclinicforms.asp

2. After the nursing assessment, the Public Health Nurse (PHN) will use the *"Case Management Timeline – A Tracking Form for TB Medical Records"* located on the TB web pages at http://www.health.state.ga.us/programs/tb/phclinicforms.asp to determine documents to forward for review by the district TB coordinator, the district's contract physician and the state office. The district's TB Coordinator will forward pertinent records to the state office, including (but not limited to) the following:

    a. Complete health history and pertinent physical findings.

    b. Hospital discharge summaries (if available).

    c. Treatment assessment and plan for DOT.

    d. All other pertinent clinical data (e.g., prior chest x-rays, if available, and lab work).

3. Review the respiratory isolation status for the **patient.** All 3 of the following criteria must be met in order for isolation to be discontinued:

    a. **Patient** has three consecutive negative AFB sputum smear results.

    b. **Patient** has received standard anti-tuberculosis treatment for a minimum of two weeks.

c. **Patient h**as demonstrated clinical improvement.

During the initial treatment, **it may be necessary to expedite meeting these criteria**. There must be a minimum of 8 hours between collection times if two samples are obtained on the same day. Early morning collection time is highest yield for detecting *M.tb.* **Mark on the lab slip to perform "AFB Smear Only" for these specimens.**

4. Monitor **patient(**s) monthly for adverse drug reactions, drug-drug interactions, drug-food interactions, drug-lab interactions, infectious status, and clinical and bacteriologic response to therapy (see Tables 3, 4 and 5 on pages 6.1**5** – 6.1**8** for drug interactions).

5. Provide HIV test results with post-test counseling to **patient** and, if positive, appropriate referrals to HIV care. Seek confirmation that **patient** kept referral appointment for HIV care.

6. Conduct a contact investigation following the ***Tuberculosis Policy and Procedure Manual,*** the*Tuberculosis Nursing: A Comprehensive Guide to Patient Care, 2nd Edition,* and the *CDC Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis* (current edition) to include:

   a. The initial interview of the index **patient** should be done by the PHN or designee (e.g., Communicable Disease Specialist) for all cases and suspects in the hospital (preferred) within one to three working days of health department notification. The follow-up interview should occur 1-2 weeks later, preferably in the **patient**'s home.

   b. Start screening with high priority contacts in home, work, school and social environments. High priority contacts would be those persons with the greatest intensity, frequency and duration of exposure to the person who has infectious TB. Take into consideration risk factors (see item c immediately below) as well as exposure in determining high priority contacts. **NOTE:** High-priority contacts should be examined within seven working days. Medium priority contacts should be examined within fourteen calendar days. Low priority contacts should be examined within thirty calendar days.

**c.** High priority contacts who are considered a medical risk should be examined immediately regardless of initial TST or IGRA. Persons at particularly high risk of developing TB disease once infected with *M. tuberculosis* include: children less than 5 years of age and persons with immune systems compromised by HIV infection, immunosuppressive medications (prednisone, cancer chemotherapy, anti-rejection drugs for cancer therapy, tumor necrosis factor alpha agents antagonists) and certain medical conditions (diabetes mellitus, silicosis, end stage renal disease, cancer of the head and neck, reticuloendothelial diseases [e.g., lymphoma, leukemia], gastric or jejunoileal bypass surgery). **Those contacts should have a chest x-ray and if the chest x-ray is negative for active TB disease, they should be placed on presumptive latent TB infection treatment for the window period. At the 8-10 week follow-up TST evaluation, LTBI will be confirmed or ruled out and the decision to continue treatment or to discontinue treatment will be made. (See LTBI/Presumptive LTBI protocol p. 6.21).**

d. Expand the contact investigation if there is evidence of recent transmission such as a higher than expected infection rate in high priority contacts, a secondary case of TB disease, infection in a child less than five years, or a converter.

e. Contact information should be entered on the *TB Contact Investigation Report Form* (Form #3126) and promptly entered into SENDSS.

**7. Collect follow-up sputum samples as follows:**

**a. One (1) sputum specimen should be collected weekly until culture converts to negative. Mark on the lab slip that the patient is "Previous" and check "Smear, Culture, and Sensitivity" test on the form. NOTE: The AFB smear becomes negative first, before culture converts to negative.**

**b. Collect one (1) sputum specimen at 60 days after treatment initiation. Mark "Smear, Culture, and Sensitivity" test on the lab form. This test result is a measure of effectiveness of therapy and positive results identify patients at increased risk for relapse. If**

**the culture is still positive, refer treatment to the contract physician.**

**c. Obtain one (1) monthly sputum specimen for "Culture, Smear, Sensitivity" throughout the entire course of therapy. If the patient is unable to produce sputum, document the collection attempt.**

8. Perform the following blood chemistry tests monthly to monitor reactions to TB drugs: AST (SGOT), ALT (SGPT), bilirubin, alkaline phosphatase and CBC with platelets. Perform serum uric acid and serum creatinine monthly if there are abnormalities at baseline or there are clinical reasons to obtain the measurements (e.g., hepatitis B or C virus infection, alcohol abuse, abnormal kidney function).

9. Discontinue the isoniazid or rifampin and report immediately to the consulting physician if any of the following occur:

   a. AST/ALT levels equal to or greater than 3 times the upper limit of normal in the presence of symptoms of adverse events.

   b. AST/ALT levels equal to or greater than 5 times the upper limit of normal in an asymptomatic **patient**.

   c. **Patient** reporting symptoms of adverse reactions.

10. Monitor the vision of **patients** taking ethambutol by providing vision checks monthly, including visual acuity and red/green color discrimination.

11. **Adherence should methodically be assessed on a monthly basis at a minimum. Results should be discussed during the regular case reviews with the staff and/or TB Coordinator. Strategies to address issues should be discussed and implemented before they become a major problem.** Use incentives and enablers to enhance adherence to therapy. These may be as simple as offering a cup of coffee and talking with a **patient** who is waiting in the clinic, or as complex as providing food and housing for a homeless **patient**.

12. Observe the **patient** for isoniazid-induced peripheral neuropathy **e.g., tingling, numbness, pain,** during the course of therapy and report to the delegating physician.

13. Treatment completion is defined by the number of doses taken as well as the duration of treatment. The number of doses required is listed in Table 1, page 6.**6**.

## CONSULTATION

Consult with the consulting physician:

1. Before changing to the continuation phase of Regimen Options (1) or (2) (see Table 1, page 6.**6**), and regarding complications that would require re-evaluation of the **patient** and possible new treatment recommendations.

2. If susceptibility results show resistance to TB drug.

3. If the **patient** remains symptomatic or smear or culture positive after two months.

4. If the **patient**'s HIV test result is positive.

5. If the **patient** refuses HIV testing.

6. To discuss abnormal laboratory test results.

7. If the **patient** is not compliant with DOT.

## REFERRAL

1. Refer **patient**s for other medical and social services as needed, particularly alcohol or drug abuse treatment, diabetes care (if hemoglobin A1C is 6.5% or higher) and HIV care. You may contact the TB state office Social Services Provider for assistance with these issues.

2. If any of the following conditions are present or develop, the case is considered a complicated TB case and TB treatment must be ordered by the district contract TB physician

    a. Children from birth through 14 years

    b. Extrapulmonary TB

    c. Currently pregnant or breast-feeding

d. Known history of infection or exposure to multiple drug resistant (MDR) M. tuberculosis, or any drug resistance on susceptibility testing

e. Known HIV infection

f. Other new and/or complicated acute or chronic medical conditions including (but not limited to): diabetes, renal insufficiency with estimated creatinine clearance less than 50 ml/min., end-stage renal disease on hemodialysis

g. BMI greater than 30 (massive obesity)

h. Known allergies to anti-tuberculosis drugs

i. Treatment with once-weekly isoniazid and rifapentine during the continuation phase

j. Decision to extend the continuation phase longer than four months (e.g., sputum culture collected 60 days after treatment initiation is positive).

3. Refer **patien**t to a licensed dietitian if indicated. This will be especially important if the **patient** has a history of drug or alcohol abuse, is breast-feeding, is HIV-infected, has GI side effects from TB drugs or if desirable weight is not maintained.

## Table 3: TREATMENT OF TB - DRUG INTERACTIONS (Format 1)

DRUG INTERACTIONS – RIFAMPIN

| Drug A | Rifampin Effects on Drug A |
|---|---|
| Anticoagulants (warfarin, coumadin) | ↓ serum concentration |
| Cardiac glycosides (digoxin) | ↓ serum concentration |
| Sulfonylureas (e.g. glipizide, glyburide, glimepiride) | ↓ serum concentration |
| Thiazolidinediones (e.g. rosiglitazone, pioglitazone) | ↓ serum concentration |
| Oral contraceptives, contraceptive implants, patch, ring, **Medroyprogesterone injections** | **↓ serum concentration** |
| Fluconazole, Voriconazole, Itraconazole | ↓ serum concentration |
| Corticosteroids | ↓ serum concentration |
| Narcotics/analgesics (methadone) | ↓ serum concentration |
| Atovaquone (**m**epron) | ↓ serum concentration |
| Dapsone | **↓ serum concentration** |
| Cyclosporine | ↓ serum concentration |
| Quinidine | ↓ serum concentration |
| Protease inhibitors | ↓ serum concentration |
| Lamotrigine (lamictal) | ↓ serum concentration |
| Phenytoin (**d**ilantin) | ↓ serum concentration |
| Valproic acid and derivatives (depakene, depakote) | ↓ serum concentration |
| Buspirone (buspar) | ↓ serum concentration |
| Thyroid hormone replacement | ↓ serum concentration |

DRUG INTERACTIONS – ISONIAZID

| Drug A | Isoniazid Effects on Drug A |
|---|---|
| Diazepam (valium) | **↓ serum concentration** |
| Phenytoin (Dilantin) | ↑ **serum** concentration ↑ toxicity |
| Carbamazepine (tegretol) | ↑ **serum** concentration ↑ toxicity |
| Citalopram (**c**elexa) | ↑ **serum** concentration ↑ toxicity |

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions.

**Table 4: TREATMENT OF TB - DRUG INTERACTIONS (Format 2)**

DRUG INTERACTIONS – RIFAMPIN/RIFAPENTINE

| Rifampin or Rifapentine plus… | |
|---|---|
| Adefovir | Increases risk of side effects. |
| Amprenavir | Should not be used together.* Significantly decreases amprenavir levels in blood. |
| Anticoagulants | May decrease effectiveness of anticoagulants. |
| Atovaquone | Decreases atovaquone levels by 50% in blood. |
| AZT | May decrease AZT levels in blood. |
| Barbiturates | May decrease effectiveness of barbiturates. |
| Clarithromycin | Decreases clarithromycin levels by 120% in blood. |
| Corticosteroids | May decrease corticosteroid levels in blood. |
| Cyclosporine | May decrease cyclosporine levels in blood. |
| Dapsone | Decreases dapsone levels by 7- to 10-fold in blood. |
| Delavirdine | Should be taken together otherwise delavirdine levels in blood significantly decreased. |
| Diazepam | May decrease effectiveness of diazepam. |
| Digitalis | May decrease effectiveness of digitalis. |
| Disopyramide | May decrease effectiveness of disopyramide. |
| Efavirenz | Decreases efavirenz levels by 26% in blood. |
| Estrogen | May decrease effectiveness of estrogen. |
| Ethinyl Estradiol (birth control pills) | May decrease ethinyl estradiol levels in blood. |
| Fluconazole | Decreases fluconazole levels by 23% in blood. |
| Halothane | May increase risk of liver toxicity. |
| Indinavir | May increase rifampin levels in blood. Should not be used together.* |
| Isoniazid | May increase risk of liver toxicity. |
| Itraconazole | May decrease itraconazole levels in blood. |
| Lopinavir/ritonavir | Decreases lopinavir levels by 75% in blood. Should not be used together. |
| Methadone | May decrease effectiveness of methadone. |
| Mexilitine | May decrease effectiveness of mexilitine. |
| Nelfinavir | Decreases nelfinavir levels by 82% in blood. Should not be used together.* |
| Nevirapine | May affect rifampin and/or nevirapine levels in blood. |
| Probenecid | Increases rifampin levels in blood. |
| Progesterone | May decrease effectiveness of progesterone. |
| Quinidine | May decrease quinidine levels in blood. |
| Ritonavir | Decreases ritonavir levels by 35% in blood. |
| Theophylline | May decrease theophylline levels in blood. |

| Rifampin or Rifapentine plus… | |
|---|---|
| Verapamil | May decrease effectiveness of verapamil. |
| Voriconazole | May decrease voriconazole levels in blood. |

* The information on interactions with rifampin and HIV antiretroviral therapy (ART) is constantly changing. Consult with the consulting physician/contract physician. In general, only certain HIV medications can be used and rifampin may be replaced by rifabutin. Rifabutin is in the formulary at the state pharmacy.

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions**.**

## Table 5: DRUG INTERACTIONS – ISONIAZID

| Isoniazid plus... | |
|---|---|
| Alcohol | May increase risk of isoniazid associated hepatitis. |
| Antacids | Should be taken two hours apart otherwise isoniazid will have no effect. |
| Carbamazepine | Decreases carbamazepine metabolism. |
| Cycloserine | May increase risk of central nervous system toxicity. |
| Ethionamide | May increase risk of encephalopathy (dysfunction of the brain) and may increase isoniazid levels in blood. |
| Phenytoin | Decreases phenytoin metabolism. |

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions**.**

## REFERENCES

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# STANDARD NURSE PROTOCOL FOR LATENT TUBERCULOSIS INFECTION (LTBI) AND PRESUMPTIVE LTBI

**DEFINITION**

Latent tuberculosis infection (LTBI) means that a person has been infected with *Mycobacterium tuberculosis* but has no clinical or radiographic evidence of TB. Individuals who are infected but do not have active disease are not infectious but, if not adequately treated, are at risk for developing disease and becoming infectious in the future.

**Presumptive LTBI treatment is the practice of providing window period prophylaxis treatment to high-risk contacts of infectious TB cases for presumed *M. tuberculosis* infection when the contact has an initial negative TB skin test (TST) reaction (less than 5mm induration) or an initial negative IGRA test result and the test was performed less than 8 weeks from the contact's last exposure to the index case. The window period is the time span between the date of an initial TST or IGRA with a negative reaction and the date of the follow-up TST or IGRA.**

**Contacts at particularly high risk of developing TB disease once infected with *M. tuberculosis* include: children less than 5 years of age and persons with immune systems compromised by HIV infection, immunosuppressive medications (prednisone, cancer chemotherapy, anti-rejection drugs for cancer therapy, tumor necrosis factor alpha agents antagonists) and certain medical conditions (diabetes mellitus, silicosis, end stage renal disease, cancer of the head and neck, reticuloendothelial diseases [e.g., lymphoma, leukemia], gastric or jejunoileal bypass surgery).**

Candidates for treatment of LTBI include:

1. Persons in the following high-risk groups should be given treatment for LTBI if they have positive skin test results of equal to or greater than 5 mm or if they have a positive interferon gamma release assay (IGRA) result:

    a. HIV-positive persons.

    b. Recent contacts to a TB case.

    c. Persons with fibrotic changes on chest radiograph consistent with old TB.

    d. Persons with organ transplants and other immuno-suppressed persons (those receiving the equivalent of

equal to or greater than15 mg daily of prednisone for 1 month or longer).

2. Persons in the following high-risk groups should be considered for treatment of LTBI if their reaction to the tuberculin skin test is equal to or greater than10 mm or if they have a positive interferon gamma release assay (IGRA) result:

   a. Recent arrivals (less than 5 years) from high prevalence countries.

   b. Injection drug users.

   c. Residents and employees of high-risk congregate settings (e.g., correctional facilities, nursing homes and other long-term facilities for the elderly, homeless shelters, residential facilities for AIDS **patient**s, hospitals and other health care facilities).

   d. Mycobacteriology laboratory personnel.

   e. Persons with clinical conditions that place them at high risk of progression to TB disease (e.g., substance abuse, infection with *M. tuberculosis* within the past two years, diabetes, hematologic or reticuloendothelial malignancies, chronic renal failure, post-gastrectomy, silicosis, immunosuppressive therapy, chronic malabsorption syndromes or candidates being considered for treatment with tumor necrosis factor (TNF) antagonists such as injectable Remicade [Infliximab] for rheumatologic conditions or ulcerative colitis prior to initiation of therapy).

   f. Children less than 5 years of age, or children and adolescents exposed to adults in high-risk groups.

3. Persons with no risk factors for TB should be considered for treatment of LTBI if their reaction to the tuberculin skin test is greater than or equal to 15 mm or if they have a positive interferon gamma release assay (IGRA) result.

**Candidates for treatment of presumptive LTBI include:**

**1. Candidates for presumptive LTBI treatment who would benefit from a full course of LTBI treatment include contacts that are immunosuppressed due to the following conditions:**

**a. HIV infection.**

**b. Prolonged corticosteroid therapy.**

**c. Persons with organ transplants.**

**d. Persons on TNF-alpha inhibitors**

**2. Candidates for presumptive LTBI treatment who can stop treatment after the window period if the follow-up TST/IGRA is negative include contacts that are:**

**a. Children <5 years of age.**

**b. Persons with any of the following conditions:**

- **Diabetes mellitus.**
- **Silicosis.**
- **End stage renal disease**
- **Gastrectomy**
- **Jejunoileal bypass**
- **Leukemia**
- **Lymphoma**
- **Cancer of the head or neck**

Treatment of LTBI **or presumptive LTBI** might NOT be indicated for:

1. Persons at increased risk for adverse reactions to isoniazid and persons for whom isoniazid is contraindicated.

2. Persons who cannot tolerate isoniazid or rifampin.

3. Persons likely to be infected with drug-resistant *M. tuberculosis*. **NOTE:** They should be referred to the consulting physician.

4. Persons who are not likely to complete a course of treatment for LTBI (e.g., some homeless persons or migrant farm workers).

Treatment of LTBI might NOT be completed on:

**1.** Persons who are a contact to a TB suspect later found not to have TB. NOTE: They should be referred to the consulting physician.

**ETIOLOGY** The agent is the *Mycobacterium tuberculosis* complex.

**SUBJECTIVE**

**1. Patient provides a detailed health history**

2. May have a history of known exposure to TB

3. The absence of risk factors indicating special precautions needed for persons receiving isoniazid therapy. These risk factors include:

   a. Concurrent use of any other medications on a long-term basis, or medications that may cause interactions

   b. Alcohol abuse

   c. Previous discontinuation of isoniazid because of side effects

   d. Chronic liver disease

   e. Peripheral neuropathy

   f. Pregnancy

   g. Injection drug abuse

4. No known allergies to anti-tuberculosis drugs

5. Absence of symptoms of TB

**OBJECTIVE**

**1. Physical evaluation according to programmatic guidelines**

2. A positive Mantoux tuberculin skin test or a positive interferon gamma release assay (IGRA) result and no clinical symptoms of active disease

   **OR**

   **A negative TST or IGRA on the initial evaluation of a high-risk contact during the course of a contact investigation and it is less than eight to ten (8 – 10) weeks since the last exposure to the index case and no clinical symptoms of active disease**

   **AND**

3. Chest x-ray negative for evidence of tuberculosis disease

   **AND**

4. Absence of clinical signs of TB**,** both pulmonary and extra-pulmonary

5. If signs and symptoms of TB disease are evident, **patient** should have 3 consecutive negative sputum smears and cultures with evaluation by a clinician before starting treatment for LTBI.

**ASSESSMENT**

1. Latent tuberculosis infection (LTBI)
(without signs/symptoms of tuberculosis disease)
**OR**
**Presumptive *M. tuberculosis* infection during the window period**

2. No contraindications to isoniazid or rifampin

3. No history of documented infection from or exposure to drug-resistant *M. tuberculosis* source case

**PLAN** **DIAGNOSTIC STUDIES**

1. If documented tuberculin skin test results (including millimeters [mm] of induration), or a positive interferon gamma release assay (IGRA) result cannot be verified, perform a Mantoux tuberculin skin test **or an IGRA test**. Vaccination with live viruses may interfere with tuberculin skin test reactions. For persons scheduled to receive a tuberculin skin test, testing should be done as follows: Either on the same day as vaccination with live-virus vaccine or 4-6 weeks after the administration of the live-virus vaccine. At least one month after smallpox vaccination.

2. Baseline weight.

3. Collect blood to obtain baseline measurements for the following lab tests:

   a. AST (SGOT), ALT (SGPT), alkaline phosphatase and bilirubin.

   b. All individuals will be tested for HIV using the opt-out approach. Consent is inferred unless **patient** declines testing.

   c. Hepatitis B and C profile, if indicated (risk groups below):

      - Men who have sex with men
      - Individuals diagnosed with a sexually transmitted disease (STD)
      - Illicit drug users (injecting, inhaling, snorting, pill popping)

- Sex contacts or close household members of a person infected with Hepatitis B or C
- Persons born in countries where hepatitis B is common (Asia, Africa, South America, Pacific Islands, Eastern Europe, and the Middle East)
- Individuals born to parents who have emigrated from countries where hepatitis B is common (see above)

d. Baseline complete blood count with platelets for patients on the Isoniazid-rifapentine regimen or rifampin regimen.

**NOTE**: The baseline lab measurements are not mandatory for children less than 16 years of age, unless a complicating medical condition (e.g., HIV, liver disease, renal disease, cardiac disease) or lifestyle is known or suspected.

4. Pregnancy test, if indicated.

**THERAPEUTIC PHARMACOLOGIC**

Refer to options, dosages and interactions of isoniazid**,** rifampin and isoniazid/rifapentine in Tables A – I on pages 6**.33 –** 6**.42**.

1. Order medication for treatment in children and adults from drug stock and send copies of the drug orders to the District Pharmacist/Drug Coordinator.

2. Add pyridoxine (Vitamin $B_6$) 25-50 mg PO daily for adults on isoniazid, to prevent the development of isoniazid - induced peripheral neuropathy (see TABLE A on page 6**.33**).

**NOTE**: **DOT is REQUIRED for:**

- **All children less than 5 years of age being treated for LTBI/presumptive LTBI**
- **All persons being treated for LTBI/presumptive LTBI who are co-infected with HIV**
- **All persons being treated for LTBI/presumptive LTBI on an intermittent dosing regimen**
- **All persons on the combined isoniazid and rifapentine regimen for LTBI**

**If financial resources allow, DOT is <u>strongly</u> recommended for**:

- **Persons infected with LTBI/presumptive LTBI that are at risk for active disease (e.g., close contacts, immunocompromised persons, converters, etc.)**
- **All children five through fifteen (5 – 15) years of age being treated for LTBI/presumptive LTBI**
- **Any person being treated for LTBI/presumptive LTBI that has adherence problems**

**NOTE:** When using the Isoniazid/Rifapentine regimen, review the CDC guidelines at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6048a3.htm?s_cid=mm6048a3_e%0d%0a. Use the "Isoniazid/Rifapentine Reporting and DOT" form located at http://health.state.ga.us/programs/tb/phclinicforms.asp

## PATIENT EDUCATION/COUNSELING

Education/communication should use methods adapted to patient's cultural and linguistic background. Provide education to the **patient** and his/her family regarding the following:

1. The rationale for treatment of LTBI and the importance of attending regularly scheduled clinic appointments.

2. The difference between "latent TB infection" (LTBI) and "TB disease" and what a "positive skin test" means.

3. The signs and symptoms of TB disease and the need to report immediately if anyone has these symptoms.

4. The symptoms of adverse reactions to isoniazid, rifampin, or isoniazid/rifapentine including: GI disturbances (anorexia, heartburn, nausea, vomiting, gas, cramps, diarrhea), hepatitis (loss of appetite, persistently dark urine, yellowish skin/sclera, malaise, unexplained fever for three or more days, abdominal tenderness) and peripheral neuropathy (see Table C on page 6.3**5**). Advise the **patient** to report immediately to the Public Health Nurse or clinician if any such symptoms occur during treatment.

5. The relationship between HIV infection and TB infection and the importance of HIV testing for all TB-infected individuals.

6. The rationale for using an alternative or back-up method of birth control (e.g., copper-bearing IUD such as ParaGard, condoms, diaphragm) is that when rifampin is prescribed, it reduces effectiveness (degree depending on method) with combined oral contraceptives, progestin-only oral contraceptives, levonorgestrel implants, Depo-Provera, patch and ring. Advise condom back-up.

7. The **patient'**s immunization status. Assess and administer vaccines indicated according to the current Advisory Committee on Immunization Practices (ACIP) childhood or adult immunization schedule. See the Georgia Immunization Program Manual, Recommended Schedule and Guidelines, for current ACIP schedules and administration guidelines for each vaccine. The Georgia Immunization Manual may be accessed on line at http://www.health.state.ga.us/programs/immunization/publications.asp

8. If smoker or tobacco user, refer to a local cessation program and/or the Georgia Tobacco Quit Line, 1-877-270-STOP (7867).

9. If substance abuse known or suspected, refer for appropriate counseling.

**FOLLOW-UP**

1. At least once a month, evaluate the patient following the ***TB Program Policy and Procedure Manual, 2014*** for:

   a. Adherence to the prescribed regimen.

   b. Symptoms of hepatitis (nausea, loss of appetite, vomiting, persistently dark urine, yellowish skin, malaise, unexplained elevated temperature for more than three days, abdominal tenderness and/or right upper quadrant tenderness).

   c. Symptoms of neurotoxicity such as paresthesia of hands or feet.

   d. Maintenance of desirable weight.

   e. Adverse effects of prescribed regimen.

2. At follow-up visits, ask **patient**s about adherence to therapy.

3. Provide the HIV test result with post-test counseling and, if the test is positive, appropriately refer for HIV care. Seek confirmation that **patient** kept referral appointment for HIV care.

4. All **patient**s on LTBI therapy should be assessed for the presence of symptoms of hepatotoxicity at every encounter. **Patient**s considered at risk of hepatotoxicity should have an AST and ALT done monthly. Those considered at risk include:

    a. Those with admission of frequent past or any current alcohol use

    b. Those with admission of past or current IV drug use

    c. HIV

    d. Hepatitis B or C

    e. Pregnancy / postpartum state

5. Observe for isoniazid-induced peripheral neuropathy during the course of isoniazid therapy. When peripheral neuropathy is present and/or persists, report to the consulting physician.

6. Pregnant women, particularly African-American and Hispanic women, may be at increased risk for fatal hepatitis associated with isoniazid, according to some reports. This risk may be increased during the postpartum period. These **patients** should be closely monitored for adverse reactions throughout the course of treatment. The risk of hepatitis from isoniazid in pregnant/post-partum women does NOT preclude treatment of LTBI if these women are at extremely high risk for developing active TB (e.g., close contact, HIV-infected, or with documented recent infection or conversion).

7. Discontinue the isoniazid, rifampin or isoniazid/rifapentine and report immediately to the consulting physician if any of the following occur:

    a. AST/ALT levels equal to or greater than 3 times the upper limit of normal in the presence of symptoms of adverse events.

b. AST/ALT levels equal to or greater than 5 times the upper limit of normal in an asymptomatic **patient**.

c. If the **patient** reports any symptoms of adverse reactions obtain AST/ALT immediately and notify consulting physician.

d. Any hospital admissions or deaths due to adverse reactions are to be reported immediately to the State TB Program.

**8. Obtain monthly complete blood count with platelets for patients on the Isoniazid-rifapentine regimen or rifampin regimen**.

**9. At eight to ten (8 – 10) weeks after last exposure, a follow-up TST/IGRA is to be done on contacts on window period prophylaxis**

**a. If the follow-upTST/IGRA is positive, treatment is to continue until a full course of LTBI treatment is completed.**

**b. If the follow-upTST/IGRA is negative in a contact who is immunosuppressed including any of the following conditions, then treatment is to continue until a full course of LTBI treatment is completed:**

- **HIV infection.**
- **Prolonged corticosteroid therapy.**
- **Persons with organ transplants.**
- **Persons on TNF-alpha inhibitors**

**c. If the follow-up TST/IGRA is negative in any other contact, then the window period treatment may be discontinued.**

**10. At the end of month three (3), identify those patients who are eligible for the Telephone Nurse Monitoring Program (TNMP) according to the procedure in the *Tuberculosis Policy and Procedure Manual, 2014.***

**a. Discuss the TNMP benefits and enroll interested patients.**

**b. Follow the procedure in the *TB Policy and Procedure Manual, 2014.***

**c. Order and issue a 90 day supply of Isoniazid at the clinic visit at the end of month three (3) and at the clinic visit at the end of month six (6).**

11. A clinical symptom screen is required for all **patient**s who have a lapse in treatment. A repeat chest x-ray/evaluation is required for **patients** who are symptomatic or who have had a lapse in therapy for LTBI for two months or more.

12. Treatment completion is defined by the number of doses taken as well as the duration of treatment. The number of doses required is listed in Tables A and B, pp**.** 6**.33 –** 6.3**4**.

## CONSULTATION

Consult with the TB Program medical consultant or consulting physician:

1. Regarding any complications of treatment for LTBI with **patient**s placed on Isoniazid, rifampin or Isoniazid/rifapentine (see Tables A - F on pages 6**.33 –** 6.3**9** for drug interactions, drug adverse reactions and drug monitoring).

2. If a **patient'**s HIV test result is positive, or if a **patient** at risk refuses HIV testing.

3. About any abnormal lab test results.

## REFERRAL

1. Refer p**atient**s for other medical and social services as needed, particularly alcohol or drug abuse treatment and HIV care.

2. Refer all **patient**s with complications (pregnant women, breast-feeding women, **patient**s with acute or chronic conditions, **patient**s exposed to drug-resistant TB, HIV-infected **patient**s taking protease inhibitors) to the consulting physician.

3. Refer children aged 2 through 11 years of age who are close contacts for whom the Isoniazid and Rifapentine regimen may be considered because it offers practical advantages or because the child is unlikely to complete 9 mo of daily Isoniazid.

## Table A: TREATMENT OF LTBI - RECOMMENDED DRUG REGIMENS FOR ADULTS (persons 18 and over)

| Drug | Interval and Duration | Adult Dosage | Criteria for Completion | Comments |
|---|---|---|---|---|
| Isoniazid* | Daily self-adm **for 9 months<br><br>Daily DOT for 9 months ♦<br><br>Twice-weekly DOT for 9 months | 300 mg PO (5 mg/kg - Maximum Dose 300 mg)<br>300 mg PO (5 mg/kg - Maximum Dose 300 mg)<br>900 mg PO (15 mg/kg - Maximum Dose 900 mg) | 270 doses within 12 months<br><br>190 doses within 12 months<br><br>76 doses within 12 months | In HIV-infected **patient**s, isoniazid may be taken concurrently with nucleoside reverse transcriptase inhibitors (NRTIs), protease inhibitors, or non-nucleoside reverse transcriptase inhibitors (NNRTIs).<br><br>*DOT must be used with twice-weekly dosing.*<br>NOTE: Not recommended for HIV-infected **patient**s. |
| Rifampin | Daily self-adm** for 4 months (18 weeks)<br><br>Daily DOT for 4 months (18 weeks) ♦ | 600 mg PO (10 mg/kg - Maximum Dose 600 mg)<br><br>600 mg PO (10 mg/kg - Maximum Dose 600 mg) | 120 doses within 6 months<br><br>90 doses within 6 months | Rifampin therapy may be used for persons who are contacts of **patient**s with isoniazid-resistant, rifampin susceptible TB but may also be chosen for other persons with LTBI. |
| Isoniazid* and Rifapentine | Once weekly by DOT for 12 doses | Isoniazid:<br>15 mg/kg PO (rounded up to the nearest 50 or 100 mg);<br>900 mg PO maximum<br><br>Rifapentine:<br>10.0-14.0 kg 300 mg PO<br>14.1-25.0kg 450 mg PO<br>25.1-32.0 kg 600 mg PO<br>32.1-49.9 kg 750 mg PO<br>Equal to or over 50.0 kg 900 mg (maximum dose) PO | 11 doses within 16 weeks (doses may be given no more frequently than every 72 hours) | Isoniazid and rifapentine is recommended as an equal alternative to 9 months of daily self-administered Isoniazid for treating LTBI in otherwise healthy patients aged 12 years and older at high risk for developing active TB: close contacts, recent converters, HIV infected (NOT on antiretrovirals) and those with old healed TB on chest x-ray.<br>Isoniazid and rifapentine can also be used in situations where it offers practical advantages or for individuals unlikely to complete 9 months of daily isoniazid.<br>Isoniazid and rifapentine is NOT recommended for the following patients: children age less than 2 years; HIV infected persons receiving antiretroviral treatment; pregnant women or women expecting to become pregnant during treatment; and patients who have LTBI with presumed isoniazid or rifampin resistance. |

* Consider adding pyridoxine (Vitamin B6) 25 – 50 mg to be given with each dose of isoniazid as a preventive measure against Isoniazid-induced peripheral neuropathy.

** Daily self-administered = 7 days/week ♦ Daily DOT = 5 days/week (Monday through Friday) **NOTE**: One month is 4.3 week

**NOTE:** Formula used to convert pounds to kilograms: Divide pounds by 2.2 to get kilograms. *Example: **Patient** weighs 154 pounds ÷ 2.2 = 70 kilograms.*

**NOTE:** Isoniazid is available in 100 and 300 mg tablets (both are scored for dividing in half (½). Rifapentine is available in 150 mg tablets only.

## Table B: TREATMENT OF LTBI - RECOMMENDED DRUG REGIMENS FOR CHILDREN (from birth through 17 years)

| Drug | Interval and Duration | Pediatric Dosage* | Criteria for Completion | Comments |
|---|---|---|---|---|
| Isoniazid* | Daily self-adm** for 9 months (39 weeks)<br><br>Daily DOT♦ for 9 months (39 weeks)<br><br>Twice-Weekly DOT for 9 months (39 weeks) | 10-15 mg/kg PO (Maximum Dose 300mg)<br><br>10-15 mg/kg PO (Maximum Dose 300mg)<br><br>20-30 mg/kg PO (Maximum Dose 900mg) | 270 doses within 12 months<br><br>190 doses within 12 months<br><br>76 doses within 12 months | Isoniazid for 9 months is the preferred regimen children under 18.<br><br>DOT must be used with twice-weekly dosing.<br>NOTE: Not recommended for HIV-infected **patient**s. |
| Rifampin | Daily self-adm** for 6 months (26 weeks)<br><br>Daily DOT♦ for 6 months (26 weeks) | 10-20 mg/kg PO (Maximum Dose 600mg)<br><br>10-20 mg/kg PO (Maximum Dose 600mg) | 180 doses within 9 months<br><br>130 doses within 9 months | Rifampin therapy may be used for persons who are contacts of **patient**s with isoniazid-resistant, rifampin susceptible TB but may also be chosen for other persons with LTBI. |
| Isoniazid* and Rifapentine | Once weekly by DOT for 12 doses | Isoniazid:<br>15 mg/kg PO rounded up to the nearest 50 or 100 mg; 900 mg PO maximum<br><br>Rifapentine:<br>10.0-14.0 kg 300 mg PO<br>14.1-25.0kg 450 mg PO<br>25.1-32.0 kg 600 mg PO<br>32.1-49.9 kg 750 mg PO<br>Equal to or over 50.0 kg 900 mg (Maximum dose) PO | 11 doses within 16 weeks (doses may be given no more frequently than every 72 hours) | Isoniazid and Rifapentine is recommended as an equal alternative to 9 months of daily self-administered isoniazid for treating LTBI in otherwise healthy patients aged 12 years and older at high risk for developing active TB: close contacts, recent converters, HIV infected (NOT on antiretrovirals) and those with old healed TB on chest x-ray.<br>Refer to the contract physician children aged 2 through 11 years of age who are close contacts for whom the Isoniazid and Rifapentine regimen may be considered because it offers practical advantages or because the child is unlikely to complete 9 mo of daily Isoniazid.<br>Isoniazid and Rifapentine is NOT recommended for the following patients: children age less than 2 years; HIV infected persons receiving antiretroviral treatment; pregnant women or women expecting to become pregnant during treatment; and patients who have LTBI with presumed Isoniazid or rifampin resistance. |

**Daily self administrated (adm) = 7 days/week ♦ Daily DOPT = 5 days/week (Monday through Friday). NOTE: One month is 4.3 weeks.

* Formula used to convert pounds to kilograms: Divide pounds by 2.2 to get kilograms. *Example: **Patient** weighs 154 pounds ÷ 2.2 = 70 kilograms.*

**NOTE**: Directly Observed Therapy (DOT) is REQUIRED for all **patients** less than 5 years of age, **patients** on ANY intermittent dosing regimen (including the combined isoniazid and rifapentine regimen). Directly Observed Therapy (DOT) is recommended for all children up to the age of 15 years.

**NOTE**: Isoniazid is available in 100 and 300 mg tablets (both are scored for dividing in half (½). Rifapentine is available in 150 mg tablets only.

## Table C: TREATMENT OF LTBI - DRUG ADVERSE REACTIONS AND MONITORING

| Drug | Adverse Reactions | Monitoring | Comments |
|---|---|---|---|
| Isoniazid | Gastrointestinal (GI) upset, hepatic enzyme elevations, hepatitis, peripheral neuropathy, mild effects on central nervous system, drug interactions | Baseline measurements of AST for adults.<br><br>Repeat measurements:<br>– if baseline results are abnormal<br>– if **patient** is at high-risk for adverse reactions<br>– if **patien**t has symptoms of adverse reactions | Hepatitis risk increases with age and alcohol consumption.<br><br>Pyridoxine can prevent isoniazid-induced peripheral neuropathy. |
| Rifampin and Rifapentine | Orange discoloration of body fluids (secretions, tears, urine), GI upset, drug interactions, hepatitis, thrombocytopenia, rash, fever, Influenza-like symptoms, hypersensitivity reaction* | Complete blood count, platelets and liver function tests.<br><br>Repeat measurements if:<br>– baseline results are abnormal<br>– **patient** has symptoms of adverse reactions | Hepatitis risk increases with age and alcohol consumption. |

* Hypersensitivity reaction to rifamycins (rifampin or rifapentine):

Hypersensitivity reactions may include a flu like syndrome (e.g. fever, chills, headaches, dizziness, musculoskeletal pain), thrombocytopenia, shortness of breath or other signs and symptoms including wheezing, acute bronchospasm, urticaria, petechiae, purpura, pruritus, conjunctivitis, angioedema, hypotension or shock.

- If moderate to severe reaction (e.g., thrombocytopenia, hypotension), hospitalization or life-threatening event:
  *Discontinue treatment*

- *If mild reaction (e.g., rash, dizziness, fever):*
  *Continue to monitor patient closely with a low threshold for discontinuing treatment*

## Table D: TREATMENT OF LTBI - DRUG INTERACTIONS (Format 1)

DRUG INTERACTIONS – RIFAMYCINS (Rifampin, Rifapentine*)

* Rifapentine has interactions similar to rifampin. It induces cytochromes P4503A4 and P4502C8/9 (less than rifampin)

| Drug A | Rifampin Effects on Drug A |
|---|---|
| Anticoagulants (warfarin, coumadin) | ↓ serum concentration |
| Cardiac glycosides (digoxin) | ↓ serum concentration |
| Sulfonylureas (e.g. glipizide, glyburide, glimepiride) | ↓ serum concentration |
| Thiazolidinediones (e.g. rosiglitazone, pioglitazone) | ↓ serum concentration |
| Oral contraceptives, contraceptive implants, patch, ring, **medroxyprogesterone injection** | ↓ **serum concentration** |
| Fluconazole, Voriconazole, Itraconazole | ↓ serum concentration |
| Corticosteroids | ↓ serum concentration |
| Narcotics/analgesics (methadone) | ↓ serum concentration |
| Atovaquone (**m**epron) | ↓ serum concentration |
| Dapsone | ↓ **serum concentration** |
| Cyclosporine | ↓ serum concentration |
| Quinidine | ↓ serum concentration |
| Protease inhibitors | ↓ serum concentration |
| Lamotrigine (lamictal) | ↓ serum concentration |
| Phenytoin (**d**ilantin) | ↓ serum concentration |
| Valproic acid and derivatives (depakene, depakote) | ↓ serum concentration |
| Buspirone (buspar) | ↓ serum concentration |
| Thyroid hormone replacement | ↓ serum concentration |

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DRUG INTERACTIONS – ISONIAZID

| Drug A | Isoniazid Effects on Drug A |
|---|---|
| Diazepam (Valium) | ↓ **serum concentration** |
| Phenytoin (Dilantin) | ↑ **serum** concentration ↑ toxicity |
| Carbamazepine (tegretol) | ↑ **serum** concentration ↑ toxicity |
| Citalopram (Celexa) | ↑ **serum** concentration ↑ toxicity |

**NOTE**: Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions.

## Table E: TREATMENT OF LTBI - DRUG INTERACTIONS (Format 2)

DRUG INTERACTIONS – RIFAMPIN/RIFAPENTINE

| Rifampin or Rifapentine plus… | |
|---|---|
| Adefovir | Increases risk of side effects. |
| Amprenavir | Should not be used together.* Significantly decreases amprenavir levels in blood. |
| Anticoagulants | May decrease effectiveness of anticoagulants. |
| Atovaquone | Decreases atovaquone levels by 50% in blood. |
| AZT | May decrease AZT levels in blood. |
| Barbiturates | May decrease effectiveness of barbiturates. |
| Clarithromycin | Decreases clarithromycin levels by 120% in blood. |
| Corticosteroids | May decrease corticosteroid levels in blood. |
| Cyclosporine | May decrease cyclosporine levels in blood. |
| Dapsone | Decreases dapsone levels by 7- to 10-fold in blood. |
| Delavirdine | Should be taken together otherwise delavirdine levels in blood significantly decreased. |
| Diazepam | May decrease effectiveness of diazepam. |
| Digitalis | May decrease effectiveness of digitalis. |
| Disopyramide | May decrease effectiveness of disopyramide. |
| Efavirenz | Decreases efavirenz levels by 26% in blood. |
| Estrogen | May decrease effectiveness of estrogen. |
| Ethinyl Estradiol (birth control pills) | May decrease ethinyl estradiol levels in blood. |
| Fluconazole | Decreases fluconazole levels by 23% in blood. |
| Halothane | May increase risk of liver toxicity. |
| Indinavir | May increase rifampin levels in blood. Should not be used together.* |
| Isoniazid | May increase risk of liver toxicity. |
| Itraconazole | May decrease itraconazole levels in blood. |
| Lopinavir/ritonavir | Decreases lopinavir levels by 75% in blood. Should not be used together. |
| Methadone | May decrease effectiveness of methadone. |
| Mexilitine | May decrease effectiveness of mexilitine. |
| Nelfinavir | Decreases nelfinavir levels by 82% in blood. Should not be used together.* |
| Nevirapine | May affect rifampin and/or nevirapine levels in blood. |
| Probenecid | Increases rifampin levels in blood. |
| Progesterone | May decrease effectiveness of progesterone. |
| Quinidine | May decrease quinidine levels in blood. |
| Ritonavir | Decreases ritonavir levels by 35% in blood. |
| Theophylline | May decrease theophylline levels in blood. |

| Rifampin or Rifapentine plus… | |
|---|---|
| Verapamil | May decrease effectiveness of verapamil. |
| Voriconazole | May decrease voriconazole levels in blood. |

* The information on interactions with rifampin and HIV antiretroviral therapy (ART) is constantly changing. Consult with the consulting physician/contract physician. In general, only certain HIV medications can be used and rifampin may be replaced by rifabutin. Rifabutin is in the formulary at the state pharmacy.

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions**.**

## Table F: DRUG INTERACTIONS – ISONIAZID

| Isoniazid plus... | |
|---|---|
| Alcohol | May increase risk of isoniazid associated hepatitis. |
| Antacids | Should be taken two hours apart otherwise isoniazid will have no effect. |
| Carbamazepine | Decreases carbamazepine metabolism. |
| Cycloserine | May increase risk of central nervous system toxicity. |
| Ethionamide | May increase risk of encephalopathy (dysfunction of the brain) and may increase isoniazid levels in blood. |
| Phenytoin | Decreases phenytoin metabolism. |

**NOTE:** Refer to current drug reference or drug package insert for a complete list of adverse drug reactions and drug interactions.

## Table G: PEDIATRIC DOSAGE - ISONIAZID IN CHILDREN AND ADOLESCENTS

DAILY DOSAGE OF ISONIAZID IN CHILDREN AND ADOLESCENTS

| Child's Weight in lbs | Child's Weight in kg | Daily Dose (mg) 10-15 mg/kg |
|---|---|---|
| 6 – 14 | 3 – 6 | 50 |
| 14.5 – 21 | 6.5 – 9.5 | 100 |
| 22 – 29 | 10 – 13 | 150 |
| 30 – 35 | 13.5 – 16 | 200 |
| 36 – 43 | 16.5 – 19.5 | 250 |
| 44 + | 20 + | 300 |

TWICE-WEEKLY DOSAGE OF ISONIAZID IN CHILDREN AND ADOLESCENTS

| Child's Weight in lbs | Child's Weight in kg | Twice-weekly Dose (mg) 20-30 mg/kg |
|---|---|---|
| 6.5 – 10 | 3 – 4.5 | 100 mg PO |
| 11 – 14 | 5.0 – 6.0 | 150 mg PO |
| 14.5 – 18 | 6.5 – 8.0 | 200 mg PO |
| 18.5 – 21.5 | 8.5 – 9.5 | 250 mg PO |
| 22 – 24 | 10.0 – 11 | 300 mg PO |
| 25 – 29 | 11.5 – 13 | 350 mg PO |
| 29.5 – 32 | 13.5 – 14.5 | 400 mg PO |
| 33 – 35 | 15 – 16 | 450 mg PO |
| 36 – 40 | 16.5 – 18. | 500 mg PO |
| 40.5 – 43 | 18.5 – 19.5 | 550 mg PO |
| 44 – 48 | 20 – 21.5 | 600 mg PO |
| 48.5 – 51 | 22 – 23 | 650 mg PO |
| 52 – 54.5 | 23.5 – 24.5 | 700 mg PO |
| 55 – 57.5 | 25 – 26 | 750 mg PO |
| 58 – 62 | 26.5 – 28 | 800 mg PO |
| 62.5 – 65 | 28.5 – 29.5 | 850 mg PO |
| 66 + | 30 + | 900 mg PO |

**NOTE:** Isoniazid Syrup should not be refrigerated (keep at room temperature). Isoniazid tablets can be crushed for oral administration. Isoniazid tablets are also scored.

## Table H: PEDIATRIC DOSAGES - RIFAMPIN IN CHILDREN AND ADOLESCENTS

DAILY DOSAGE OF RIFAMPIN IN CHILDREN AND ADOLESCENTS

| Child's Weight in lbs | Child's Weight in kg | Daily Dose (mg)<br>10-20 mg/kg |
|---|---|---|
| 15 – 32 | 7 – 14.5 | 150 |
| 33 – 48.5 | 15 - 22 | 300 |
| 49 – 65 | 22.5 – 29.5 | 450 |
| 66 + | 30 + | 600 |

## Table I: ISONIAZID and RIFAPENTINE DOSE AMOUNTS for PATIENTS (children and adults) prescribed weekly INH/Rifapentine for Treatment of Latent TB Infection

| Patient's Weight in lbs | Patient's Weight in kg | Isoniazid Weekly dose (mg) 15 mg/kg | Rifapentine Weekly dose (mg) 20 mg/kg |
|---|---|---|---|
| 22 – 29.3 | 10 – 13.3 | 200 | 300 |
| 29.4 – 30.9 | 13.4 – 14.0 | 250 | 300 |
| 31.0 – 36.6 | 14.1 – 16.6 | 250 | 450 |
| 36.7 – 44.0 | 16.7 – 20.0 | 300 | 450 |
| 44.1 – 51.4 | 20.1 – 23.3 | 350 | 450 |
| 51.5 – 55.0 | 23.4 – 25.0 | 400 | 450 |
| 55.1 – 58.8 | 25.1 – 26.7 | 400 | 600 |
| 58.9 – 66.0 | 26.8 - 30 | 450 | 600 |
| 66.1 – 70.5 | 30.1 – 32.0 | 500 | 600 |
| 70.6 – 73.3 | 32.1 – 33.3 | 500 | 750 |
| 73.4 – 80.9 | 33.4 – 36.7 | 550 | 750 |
| 81.0 – 88.0 | 36.8 - 40 | 600 | 750 |
| 88.1 – 95.5 | 40.1 – 43.3 | 650 | 750 |
| 95.6 – 102.9 | 43.4 – 46.7 | 700 | 750 |
| 103.0 – 110.0 | 46.8 – 49.9 | 750 | 750 |
| 110.1 – 117.4 | 50 – 53.3 | 800 | 900 |
| 117.5 – 124.9 | 53.4 – 56.7 | 850 | 900 |
| 125+ | 56.8+ | 900 | 900 |

**NOTE**: Isoniazid is available in 100 and 300 mg tablets (both are scored for dividing in half (½). Rifapentine is available in 150 mg tablets only. This means a **patient** of average weight (125 lbs or more) will need to take 3 tablets of Isoniazid and 6 tablets of Rifapentine. **Patient**s need to be aware of the pill burden when offered this regimen.

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